

PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q67539

Masafumi NISHITANI, et al.

Appn. No.: 10/000,219

Group Art Unit: 1764

Confirmation No.: 9175

Examiner: Thanh P. DUONG

Filed: December 4, 2001

For: GOLF CLUB

DECLARATION UNDER 37 C.F.R. § 1.132

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Masaomi HIRUTA hereby declare and state:

THAT I am a citizen of Japan;

THAT I have received the degree of Bachelor in Engineering from the University of
Tsukuba;

THAT I have been employed by Bridgestone Sports Co., Ltd. since 1993, where I am
responsible for development and protection of golf equipment technology, including golf club
technology;

THAT I have reviewed the patent application of Masafumi NISHITANI, et al.,
Application No. 10/000,219, filed December 4, 2001, including the Office Action of May 9,
2006 and the disclosures of Chen (U.S. Patent No. 6,368,233), Ciasullo (U.S. Patent No.
6,739,984), Kosugi et al. (U.S. Patent No. 6,106,412), Shaw et al. (U.S. Patent No. 5,423,535),

DECLARATION UNDER 37 C.F.R. § 1.132
Application Serial No. 10/000,219
Attorney Docket No. Q67539

Peterson (U.S. Patent No. 6,339,869), and Galy (U.S. Patent No. 5,971,867), which are relied upon by the Examiner in the Office Action;

THAT because of my experience and studies, I am very familiar with the technology disclosed in the foregoing U.S. Patent Application and patent documents.

As a result of my detailed review of the above items, I make the following observations.

A. Structural Distinctions in Laser Welding with Press Forming or Plastic Working versus Conventional Welding.

The structure of a wood type golf club in which a plurality of metal pieces are fixed together by laser welding and press forming is performed on the laser welded pieces to form a curved surface portion of a member of the golf club, such as a striking face member, a crown member, side wall member, or a sole member, differs structurally from both a golf club having multiple metal pieces on a curved surface portion that are welded by conventional welding techniques and from a golf club in which multiple metal pieces are formed into shape prior to welding the pieces to form a curved surface portion.

1. Gaps between pieces are necessary for conventionally welding cast or press formed pieces, while gaps are not present when high energy laser welding is used.

In the manufacture of a metallic hollow golf club head, generally at least two members are necessary, e.g., a head main portion having an opening and a lid portion to cover the opening. The lid portion may be, for example, a sole member or a face member.

These members are made by casting or press forming from plate material. The casting is generally an investment casting method. The procedures typically associated with investment casting include: injection molding wax into a mold to form a wax replica of a part, such as a golf club head, coating the wax replica with a ceramic slurry, heating the ceramic slurry to form a ceramic cast and running off the heated wax from the hardened ceramic cast, casting metal, such as stainless steel, into the ceramic cast, and then separating the ceramic cast from the metal golf club head. In these procedures, the wax contracts and is distorted by heat on replacing the wax. The metal also contracts during casting into the ceramic cast.

Although dies are designed taking into account these contractions, errors due to contraction are unavoidable. Accordingly, the head main portion and the lid portion are designed so as to leave a gap between them. If the lid portion becomes too large, another process would be necessary.

Also, plastic working or press forming can result in spring back of the worked material, which can be another source of dimensional variation and another reason for designing the head portion and lid portion so as to leave a gap between them.

DECLARATION UNDER 37 C.F.R. § 1.132
Application Serial No. 10/000,219
Attorney Docket No. Q67539

When the head main portion and the lid portion are welded using conventional arc welding, a welding rod is used to fill the gap. On the other hand, in a high-energy welding, such as laser welding, both materials are butted, and only the butted materials are melted and welded. Moreover, since a welding rod is not used, the weight of the resulting welded structure is the same as the combined weight of the pieces prior to welding. By contrast, in conventional welding in which a welding rod is used to fill the gap, the weight of the welded structure would be different. In addition, when there is a gap between metals to be welded, it may be impossible to weld by laser welding, since no welding rod is used to fill the gap.

2. The addition of the melted welding rod creates a bead and changes the weight of the conventionally welded structure, while a laser welded does not create a bead or alter the structure.

In laser welding, energy is concentrated at the weld joint, and it is not necessary to heat the surrounding structure. As the energy is high, localized melting is possible and the heat effect on the surrounding structure is small. On the other hand, in conventional welding using a welding rod, both the welding rod and the metal pieces are melted, thereby filling the gap with the melted welding rod.

Also, a bead formed by the melting of the welding rod will harden and contract upon cooling. Thus, on the left and right of the welding part (i.e., the joint region), the bead will

shrink and a surface sink will appear. Conversely, laser welding does not result in such a bead since the weld is formed by localized heating of the metal pieces at the joint region.

Further, the increase in weight resulting from the welding rod is undesirable in a golf club surface member, such as a crown member or the side member, which is relatively thin. Indeed, since the weight of the bead part cannot be controlled, manufacturing variation in conventional welding cannot be avoided. It becomes difficult to reduce weight, because the head becomes large and a weight is attached at a specific position.

3. Conventional welding involves heat exposure to a greater area surrounding the joint region producing structural changes not found in laser welding.

In conventional arc welding, a large region of the metal pieces near the joint is heated. This heating alters the surrounding metal on a structural level. Thus, a large region of a conventionally welded structure may become brittle, resulting in a comparatively weaker structure.

However, laser welding involves heat energy precisely applied to a localized region focused at the joint. The metal surrounding the joint is therefore exposed to lower levels of heat, and the results of heat exposure are less severe, which represents yet another structural distinction. Further, plastic forming of the laser welded structure is possible, since the structure surrounding the joint is not widely affected by heat.

Thus, by joining the plurality of metal pieces of a surface member of a wood-type golf club by laser welding, deterioration of the metal pieces at the welding joint is minimized, thereby ensuring a smooth, uninterrupted outer common surface. The compound part is then suitable for post-machining, such as plastic working. By laser welding plural pieces to form an outside common surface, such as a striking face member, a crown member, side wall member, or a sole member, followed by plastic working, such as press-forming, the resulting component will have both a smooth, uninterrupted surface and be durable. By contrast, as discussed above, conventionally welded pieces differ structurally due to the additional weight from the welding rod, the gaps between the respective pieces of a compound surface member which must be filled by the welding rod, and the exposure of heat to a greater region surrounding the weld weakens resulting structure.

B. Explosion Welding Involves Overlapping Pieces, Not Pieces on a Common Surface.

Explosion welding, as described in Ciasullo, is a technique for joining a metal piece to another metal piece which lies over it. In other words, explosion welding is a technique of crimping using a gunpowder explosion. However, explosion welding is different from conventional welding since neither the base material nor the cladding melts as in conventional welding. Rather, in explosion welding, metal in the vicinity of a collision point exhibits floating behavior such that the metal around the bonded interface of overlying pieces is strongly plastic-

DECLARATION UNDER 37 C.F.R. § 1.132
Application Serial No. 10/000,219
Attorney Docket No. Q67539

deformed and then jointed. Further, the interface of the explosion welded pieces has a wave shape.

As a result, explosion welding cannot be applied to a butt joint. Explosion welding is therefore not suitable for welding end faces, such as in plural metal pieces on an outside surface of a golf club.

On the other hand, laser welding is a fusion welding method utilizing a laser beam as a heat source. Since a laser has a large light focusing property, the laser beam can be used as a strongly concentrated heat source having a large energy density. Further, the welding operation can be controlled precisely and laser welding does not entail the generation of X-rays. Non-metallic material such as ceramics can be welded by laser welding.

Also, as noted above, in material processing involving laser welding, heat affection to the welded materials is smaller than conventional welding. Accordingly, the deformation of welded materials is less than in explosion welding, or the conventional welding with a welding rod for reasons discussed above.

Thus, explosion welding, as in Ciasullo, does not apply to multiple pieces appearing on an outside surface. Rather, the explosion welding bonds overlapping pieces, such as stainless outer shell 26 and titanium inner shell 32, or outer shell 36 and inner shell 40.

Moreover, Ciasullo teaches that after the explosion welding of the overlapping pieces is performed, the overlapping pieces are shaped or forged, then welded, as discussed at column 5, lines 10-24. The structure of a surface member of a wood golf club including multiple metal

pieces that are forged (i.e., shaped) prior to welding by conventional means is structurally distinct from a laser welded structure followed by press forming, as discussed above.

C. Structural Differences and Disparate Design Considerations in Striking Faces of Wood Golf Club Heads versus Iron Golf Club Heads.

Shaw teaches the striking face of an iron golf club may have multiple pieces. However, significant differences both in structure and design considerations exist between iron golf clubs and wood golf clubs. Thus, the structure of a iron golf club cannot simply be interchanged with a wood golf club.

For instance, an iron golf club does not have shell pieces that define a hollow cavity, as in the hollow inner structure of a wood golf club. Also, the face-plate thickness of an iron is much thicker than a face plate of a wood golf club due to the increased weight of an iron club and the different shape. Since the force on the iron is small when the golf ball is hit, the face of the iron is unlikely to deform. Thus, as disclosed by Shaw at column 4, lines 23-29, it is possible to use all sorts of bonding.

By contrast, the thickness of a wood golf club striking face is much thinner. Further, since the force on the wood is relatively large when the ball is hit, the face of the wood is likely to undergo deformation. As a result, a strong welding method is important in wood golf clubs. However, since the face is thin, it is difficult to perform ordinary bonding. Thus, the

DECLARATION UNDER 37 C.F.R. § 1.132
Application Serial No. 10/000,219
Attorney Docket No. Q67539

characteristics and constraints of wood golf club and iron golf club designs differ significantly and the structure of an iron golf club striking face cannot readily be applied to a wood golf club.

Conclusion

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: Sep/07/2006

Masaomi Hiruta

Masaomi HIRUTA